Hydraulic filling procedure

This procedure covers filling of an empty bubble chamber with degassed mineral oil. This procedure is to be followed in conjunction with Mineral Oil Handling Procedure.

In addition to the hazards of propylene glycol stated in Procedure 3, there is a grave risk of damaging the inner vessel bellows or cracking the inner vessel glass with this procedure. The technical problem is that when the pressure vessel is evacuated for filling or degassing, the net pressure on the bell jar and bellows can be reversed from 15 psi compression to as >1 psi expansion force. This could cause the bellows to over-extend and be damaged.

1. Review Procedure "Mineral Oil Handling Procedure" and have it available.

2. Set the NESLAB to control its internal bath temperature to 55°C.

3. The empty pressure vessel should have been leak checked prior to this procedure. Insert the inner vessel and seal the pressure vessel using the appropriate procedures.

4. Run the cart Commissioning Tool. Start data logging every 60 seconds. Ensure that the cameras and lighting system are fully operational.

5. Follow the "Before Mineral Oil Handling" section of Procedure. Set up the work area and don PPE.

6. Fill the mineral oil source jug and attach it to the line from the mineral oil reservoir. Check that MV-018 is closed.

7. Connect the top of the reservoir to a vacuum pump. Open MV-019.

8. Open all manual valves in the hydraulic system (MV-003, MV-004, MV-005, MV-006, MV-014, MV-016, MV-017). Make sure all valves to the inner chamber are closed.

9. Activate the vacuum pump until the entire system is evacuated.

10. Close MV-017. Check that the pressure in the hydraulic system does not increase.

11. Perform the water distillation into the inner vessel: see Procedure. After distillation, the bellows should be at approximately midstroke: above the

neutral position, but not fully extended. The chamber should be filled with liquid.

12. Open MV-018 to fill the reservoir with mineral oil. Close MV-018 before the fluid level reaches the bottom of the line to the reservoir. Ensure that more mineral oil is in the reservoir than required to entirely fill the hydraulic system. Record the initial height of oil in the reservoir.

13. Turn off the vacuum pump and vent the reservoir.

14. Open MV-017 to start filling the hydraulic system with oil. Watch fluid level dropping in reservoir. Make sure that, once flow has stopped, approximately the correct volume of fluid has entered the system.

15. Close MV-016 and MV-004.

16. Check pressure on AC-001. Use PU-001 to raise pressure to slightly above desired level. If initial volumes were set correctly, this should leave the accumulator more than half full of oil.

17. Close MV-005, MV-006, and MV-014.

18. Using PR-001, set the desired pressure in AC-002. Use EV-002 and EV-003 to set the desired volume. If initial volumes were set correctly, this should leave the accumulator slightly less than half full of oil.

19. Cool the glycol to 20°C. Cool to a lower temperature for C_3F_8 filling. Use Procedure 6.2 Bubble Chamber Temperature Ramp up/down.

20. Note that MV-4 to AC-2 remains closed until the C_3F_8 fill.

21. Clean up any oil spillage and oil residue from off the system.

22. Complete the "After Mineral Oil Handling" section of Procedure.